

## The 630 nm and 557.7 nm Airglow During HF Ionosphere Pumping by the SURA Facility Radiation for Pump Frequencies Near the Fourth Electron Gyroharmonic

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### Abstract

© 2015, Springer Science+Business Media New York. We present the results of analysis of the dependence of the ionospheric airglow in the red (630 nm) and green (557.7 nm) lines of atomic oxygen on the pump-wave frequency  $f_0$  near the fourth electron gyroharmonic  $4f_{ce}$ . The experimental data were obtained in 2012 using the SURA heating facility. Stimulated electromagnetic emission spectra were used to determine the relation between  $f_0$  and  $4f_{ce}$ . It is found that at  $f_0 > 4f_{ce}$  and  $\delta f = f_0 - 4f_{ce} \approx 15\text{--}20$  kHz the red-line airglow intensity is about a factor of 1.5 higher for the magnetic zenith pumping (when the pump beam is inclined  $12^\circ$  south of the magnetic field direction) than for the vertical pumping. In the green line for the same offsets  $\delta f$ , the airglow was recorded with confidence only during magnetic zenith pumping. During vertical pumping, no regular dependence of the red-line airglow intensity on  $\delta f$  in the range  $-15 < \delta f < 280$  kHz was obtained, while the green-line airglow was observed at  $15 < \delta f < +5$  kHz and  $230 < \delta f < 280$  kHz. In the red line during vertical pumping, a change from the artificial airglow generation to the ionospheric background suppression was detected when the F-layer cutoff frequency was decreased. During magnetic zenith pumping, a wide (about  $30^\circ$ ) background suppression zone was observed around the airglow spot with an about  $6^\circ$  angular width.

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